TSXAA-B

WIDEBAND ELECTRONIC COUNTERMEASURES TEST SET

The following purchase description describes the individual units which make up an all solid state wideband electronic countermeasures test set with a frequency range of 50 MHz to 40 GHz. The units are as follows:

1. Synthesized Microwave Signal Generator (50 MHz to 26.5 GHz)
2. System Controller
3. Countermeasures Test Set Accessories
4. Wideband Microwave Frequency Extender
5. Digital Voltmeter

WIDEBAND MICROWAVE SIGNAL GENERATOR

1. GENERAL. This procurement requires an all solid state, synthesized, wideband microwave signal generator covering a frequency range of 50 MHz to 26.5 GHz and including the ability to measure external frequencies* and external power levels. Plug-ins are NOT acceptable for any portion of this equipment. Additionally, it should be capable of driving and controlling the output of a 26-40 GHz frequency extender.

2. CLASSIFICATION. The signal generator described herein shall meet the requirements of MIL-T-28800, Type III, Class 5, Style E, Color R for Navy shipboard, submarine, and shore applications with the following modifications and exceptions:

a. The relative humidity requirement is limited to 95% noncondensating.

b. Altitude. Not required

c. The equipment warm-up period is 20 minutes.

3. OPERATIONAL REQUIREMENTS.

Note. FE means operating in Frequency Extension mode.

3.1 Frequency characteristics.

3.1.1 Frequency range. 50 MHz to 26.5 GHz.

3.1.1.1 FE. 26-40 GHz.

3.1.2 Frequency resolution. The displayed frequency resolution shall be at least 1 MHz.

3.1.2.1 FE. At least 2 MHz.

3.1.3 Frequency accuracy (CW mode). The measured output frequency shall be within 1 ppm of the indicated or set output frequency.

3.1.4 Frequency stability.

3.1.4.1 Long term stability. Less than 1 pp 10^{-9}/hr after one hour warmup

3.1.4.2 Phase noise. At least -65 dBc/Hz at an offset 10 kHz from any CW carrier within its frequency range.

3.1.4.3 Residual FM peak deviation (BW = 50 Hz to 15 kHz).

3.1.4.3.1 Less than 1 kHz for output frequencies up to 1 GHz.

3.1.4.3.2 Less than the square root of (F/1000) where F is the carrier frequency in Hz for output frequencies greater than 1 GHz.

3.1.5 Spectral purity (at least the limits specified below).

3.1.5.1 Harmonics/Subharmonics. At least -55 dBc.

3.1.5.2 Nonharmonics/Spurious. At least -55 dBc.

3.1.6 Reference frequency.

3.1.6.1 Internal reference output. 10 MHz; 1 Vrms into 50Ω.

3.1.6.2 External reference input. 10 MHz minimum; 1 Vrms into 50Ω.
3.1.6.3 External reference output. 10 MHz; 1 Vrms into 50Ω.

3.1.7 Frequency lock indicator. A front panel indicator shall be provided which shall indicate that the output frequency is phase locked to the reference frequency.

3.2 Output characteristics.

3.2.1 Output impedance/connector. 50Ω; Weinschel WPM-3 male/female or equivalent.

3.2.1.1 VSWR. Less than 2:1.

3.2.2 Output level. -99 dBm to +5 dBm leveled.

3.2.3 Output resolution. 0.1 dBm in a digital readout.

3.2.4 Level accuracy (displayed level vs measured output level).

3.2.4.1 ±1.0 dB from 0.1 to 18 GHz; ±2.0 dB from 18 to 26.5 GHz for output levels greater than -40 dBm.

3.2.4.2 Below -40 dBm, additional measurement uncertainty of ±0.2 dB/10 dB step down to -90 dBm.

3.2.5 Level loop control indicator. A front panel indicator shall be provided which shall indicate that the output signal level is under active control of the feedback circuit in the leveling loop. An unleveled indication on this display shall mean that the output amplitude is unleveled regardless of the actual amplitude measured at the output.

3.3 Modulation characteristics.

3.3.1 Square wave modulation (internal).

3.3.1.1 Rate (at least). 1 kHz fixed; variable from 100 Hz to 50 kHz.

3.3.2 Pulse modulation (internal).

3.3.2.1 Rate (at least). 1 kHz fixed; variable from 100 Hz to 50 kHz.

3.3.2.2 Width (at least). 1 μsec fixed; variable from 0.1 to 10 μsec.

3.3.2.3 Rise/Fall time. Less than 25 nsec.

3.3.2.4 Overshoot/Undershoot/Ringing. ±2.0 dB maximum.

3.3.2.5 Settling time. ±1.0 dB of the final within 100 nsec.

3.3.2.6 On/Off ratio. Greater than 30 dB.

3.3.3 Pulse modulation (external).

3.3.3.1 Rate (at least). 10 Hz to 500 kHz.

3.3.3.2 Width. 0.1 to 10 μsec.

3.3.3.3 Triggering. Rising or falling edge.

3.3.4 Sync output. Modulation waveform, TTL compatible.

3.4 Sweep characteristics.

3.4.1 Sweep type. Discrete frequency steps, noncontinuous.
3.4.2 Range. 50 MHz to 26.5 GHz.

3.4.3 Step size. 1 MHz, 10 MHz, 100 MHz minimum. FE. 2, 20, 200 MHz.

3.4.4 Step time. Variable 1 step/msec to 1 step/sec.

3.4.5 Ramp output. 0 to 10V, proportional to the frequency between selected sweep limits.

3.4.6 Output flatness. Within ±1.0 dB to 18 GHz; ±2.0 dB from 18 to 26.5 GHz.

3.4.7 Sweep mode. Auto (continuous), single, single step, reset.

3.4.8 Sweep trigger. External input for triggering sweep, TTL compatible.

3.4.9 Pen lift. TTL compatible output, low level during retrace.

3.5 Power meter.

3.5.1 Frequency range. 50 MHz to 26.5 GHz.

3.5.2 External measurement range. +10 dBm to -30 dBm.

3.5.3 Accuracy (indicated power level vs externally measured level):

±1.0 dB (+10 dBm to -10 dBm); ±2.0 dB (-10 dBm to -30 dBm)

3.5.4 Display. Digital; 3.5 digits minimum.

3.5.4.1 Resolution. 0.1 dB minimum for all power readings.

3.5.5 Input connector. Female, Weinschel WPM-3 or equivalent.

3.6 Frequency counter. *

3.6.1 Input range. At least 100 MHz to 26.5 GHz.

3.6.2 Resolution. At least 100 Hz.

3.6.3 Sensitivity. -25 dBm to 18 GHz; -20 dBm from 18 to 26.5 GHz.

3.6.4 Mode. CW or pulsed input.

3.6.4.1 Minimum PW for pulsed input. 0.5 μsec.

3.6.5 Accuracy. At least 1 ppm.

3.6.6 Input impedance. 50Ω nominal.

3.6.7 Input connector. Female, Weinschel WPM-3 or equivalent.

4. GENERAL REQUIREMENTS.

4.1 Power source. 100/120/220/240 Vac ±10%, single phase, 50, 60 or 400 Hz, less than 350 watts.

4.2 Volume. Less than 65,548 cm^3 (4000 in^3).

4.3 Weight. Less than 29.1 kg (64 lbs).

4.4 Calibration interval. The calibration interval shall be 12 months minimum. The equipment shall be within all accuracy requirements specified herein, with a 72% or greater confidence factor following a calibration interval of 12 months.

4.5 Remote programming. The generator shall be capable of being remotely controlled via a RS-232 interface, operating as both a talker and listener, having control of at least the following parameters is required.

Output Frequency	External Power Measure
Output Amplitude (-99 to +5 dBm)	External Frequency Measure
Sweep Function	Modulation. 1 usec PW; 1 kHz PRF
Frequency Lock Status	Amplitude Level Status

4.5.1 In FE mode. Capable of controlling external frequency and amplitude of frequency extender via external cable.

5. ACCESSORIES. The following list of accessories shall be provided with each equipment.

5.1 Microwave coaxial cables.

5.1.1 One Gore-tex GMCA 190-1265 or equivalent, 24 ft long, with male Weinschel WPM-3 connectors or equivalent on each end.

5.1.2 One Gore-tex GMCA 190-1265 or equivalent, 6 ft long, with male Weinschel WPM-3 connectors or equivalent on each end.

5.1.3 One Gore-tex GMCA 190-1265 or equivalent, 18 in long, with male Weinschel WPM-3 connectors or equivalent on each end.

5.2 Interface cables.

5.2.1 (2) RS-232, male one end, female other end, 50 ft length.

5.2.2 (2) RS-232, male one end, female other end, 25 ft length.

5.2.3 (1) FE Source-to-Frequency Extender connection cable, male both ends, 25 ft length.

5.3 Adapters.

5.3.1 One male to female, Weinschel WPM-3 or equivalent.

5.3.2 One female to female, Weinschel WPM-3 or equivalent.

* Frequency counter may be supplied as a separate piece of equipment; however, weight and volume restrictions apply to signal generator packages only.

SYSTEM CONTROLLER

1. GENERAL DESCRIPTION. This procurement requires a computer/system controller capable of interfacing with external instruments in both IEEE-488 and RS-232 bus configurations. In addition the controller must possess the following internal features. (1) typewriter keyboard with separate numeric pad, (2) screen for display of program interface with operator, (3) hardcopy printer for permanent output of test results, (4) memory device (tape or disc) for storage of data and programs.

2. CLASSIFICATION. The requirements of MIL-T-28800 are hereby waived for this device. The following operating conditions are imposed:

a. The operating temperature requirement is limited to the range of 15°C to 35°C and the nonoperating temperature requirement is limited to the range of 0°C to 50°C.

b. The relative humidity requirement is limited to 95% noncondensating.

3. OPERATIONAL REQUIREMENTS.

3.1 Storage (capacity and medium).

3.1.1 RAM. At least 32 kbytes.

3.1.2 Mass. Magnetic; at least 200 kbytes amplitude level status.

3.2 Language.

3.2.1 HP enhanced basic.

3.2.2 Compatibility. Must be compatible with previously prepared software.

3.3 Printer (hardcopy output).

3.3.1 Type. Thermal with bidirectional printing head; ink is not

acceptable.

3.3.2 Line length. At least 32 characters.

3.3.3 Character size. At least 10 point.

3.4 Operator interface.

3.4.1 Display.

3.4.1.1 Type. CRT or LCD).

3.4.1.2 Size. 103 cm^2 (16 in^2) minimum.

3.4.1.3 Lines. 16 minimum.

3.4.1.3.1 Length. 32 characters minimum.

3.4.1.4 Graphics. At least 256 x 196 pixels.

3.4.2 Keyboard. Full size typewriter-like alphanumeric with separate numeric keypad.

3.4.3 Special function keys. At least 8 available; function to be defined by operator.

3.4.4 Built-in debugging facilities.

3.5 Features.

3.5.1 IEEE-488 interface. Capable of communicating with external instruments as both talker and listener.

3.5.2 RS-232 serial interface (with male connector). Capable of communicating with external instruments as both talker and listener.

3.5.3 Clock. Built in system clock.

3.5.3.1 Timers. At least 3 independent timers.

3.5.4 Expansion capability. A minimum of four ports for interfacing and expansion.

3.5.5 Full self-test capability.

4. GENERAL REQUIREMENTS.

4.1 Power source. 115 or 230 Vac ±10%, single phase, 50, 60 or 400 Hz, 50 VA maximum.

4.2 Dimensions. The total volume of the unit shall not exceed 40967 cm^3 (2500 in^3).

4.3 Weight. The overall weight of the unit shall be less than 11.4 kg (25 pounds).

4.4 Calibration interval. None required.

5. ACCESSORIES.

5.1 ROM-drawer. Holds up to 6 external ROMs.

5.2 I/O ROM.

5.3 Advanced programming ROM.

COUNTERMEASURES TEST SET ACCESSORIES

1. GENERAL DESCRIPTION. These accessories are required for use with the CMTS in order to permit radiated measurements to be performed using the system.

2. CLASSIFICATION. The requirements of MIL-T-28800( ) are hereby waived for these accessories.

3. OPERATIONAL REQUIREMENTS.

3.1 Test antennas.

3.1.1 Spiral antenna (0.3 to 1 GHz). Antenna Corp of America M/N 3127-RC-N.

3.1.1.1 Antenna mount adapter (Giga-tronics Stock #198CF02600).

3.1.2 Horn antenna, ridged waveguide (1 to 12.4 GHz). American Electronic Lab M/N H1479.

3.1.3 Horn antenna, ridged waveguide (2 to 18 GHz). American Electronic Lab M/N H1498-T.

3.1.4 Horn antenna (18 to 26.5 GHz). Narda M/N 638.

3.1.4.1 Antenna mount adapter (A&T Technical Services M/N 81995 00 0002 29).

3.1.5 Standard gain horn (26 to 40 GHz). Scientific Atlanta M/N 12A-26.

3.2 Adapters.

3.2.1 TNC (M) to SMA (F). Midwest Microwave M/N 2686.

3.2.2 Type N (M) to SMA (F). Omni Spectra M/N 3082-2240-00.

3.2.3 Waveguide-to-coax adapter (18 to 26.5 GHz). Omni Spectra

M/N 2000-6256.

3.3 Fixed attenuators.

3.3.1 Waveguide WR-28.

3.3.1.1 15 dB

3.3.1.2 20 dB

3.3.1.3 30 dB

3.4 Antenna mounting hardware case.

3.4.1 Part #81995-00-002. Used to physically attach test antennas to existing superstructure when performing radiated systems testing.

3.5 Shipping/Carrying/Storage cases.

3.5.1 Cases.

4 Giga-tronics PCCO 01001
1 Giga-tronics PCCO 02001

3.5.2 Case liners.

1 Giga-tronics PCCL 01001
1 Giga-tronics PCCL 01002
1 Giga-tronics PCCL 01003
1 Giga-tronics PCCL 01004
1 Giga-tronics PCCL 02001

WIDEBAND MICROWAVE FREQUENCY EXTENDER

1. GENERAL DESCRIPTION. This procurement requires an all solid state, synthesized, microwave frequency extender covering the frequency range of 26 to 40 GHz using input frequencies of 13 to 20 GHz at +5 to -7 dBm. The output level of the extended frequency shall be variable from at least +5 to -15 dBm leveled.

2. CLASSIFICATION. The frequency extender described herein shall meet the requirements of MIL-T-28800, Type III, Class 5, Style E, Color R for Navy shipboard, submarine, and shore applications with the following modifications and exceptions:

a. The relative humidity requirement is limited to 95% noncondensating.

b. Altitude. Not required.

c. The equipment warmup period is 20 minutes.

3. OPERATIONAL REQUIREMENTS.

3.1 Frequency characteristics.

3.1.1 Output frequency range. At least 26 to 40 GHz.

3.1.2 Input frequency range. At least 13 to 20 GHz .

3.1.3 Output frequency resolution. 2 times the resolution of the input frequency.

3.1.4 Output frequency accuracy. Same as the input frequency.

3.1.5 Output frequency stability. Input stability degraded by factor of 2.

3.1.6 Spectral purity.

3.1.6.1 Harmonics/Subharmonics. At least -20 dBc .

3.1.6.2 NonHarmonics/Spurious. At least -20 dBc .

3.1.7 Frequency display. The output frequency shall be displayed directly on the extender's front panel or remotely on its driving source synthesizer.

3.2 Output characteristics.

3.2.1 Output level. -15 dBm to +5 dBm leveled for input levels of at least -2 dBm.

3.2.2 Output level resolution. 0.1 dBm.

3.2.3 Output level display. The output level shall be displayed directly on the extender's front panel or remotely on its driving source synthesizer.

3.2.4 Output level control.

3.2.4.1 Local operation. The output level of the frequency extender shall be controllable from the unit's front panel when operating under manual control. An indicator shall be provided indicating the leveled status of the output of the extender.

3.2.4.2 Remote operation. The output level of the frequency extender shall be controllable from the signal generator.

3.2.5 Output level accuracy. ±2.5 dB.
3.2.6 Output level flatness. ±2.5 dB.

3.2.7 Output connector. WR-28 WG waveguide with type UG-599/U flange.

3.2.7.1 Impedance. 50Ω nominal.

3.2.7.2 VSWR. Less than 2:1 worst case.

3.2.8 Input connector. WPM-3 female (SMA compatible).

3.3 Modulation characteristics.

3.3.1 Pulse/Square wave modulation.

3.3.1.1 Rate. 100 Hz to 50 kHz minimum.

3.3.1.2 Width. 0.1 to 10 μsec minimum.

4. GENERAL REQUIREMENTS.

4.1 Power source. The unit shall operate from sources of 100/200/220/ or 240 Vac ±10%, single phase, 50, 60 or 400 Hz ±10%, 20W maximum.

4.2 Volume. Less than 9850 cm^3 (600 in^3).

4.3 Weight. The overall weight of the unit shall not exceed 4.5 kg (10 lbs).

4.4 Calibration interval. The calibration interval shall be 12 months minimum. The equipment shall be within all accuracy requirements specified herein, with a 72% or greater confidence factor following a calibration interval of 12 months.

4.5 Interface control. Level must be remotely controllable through the synthesized, wideband microwave signal generator driving source via an external cable.

DIGITAL VOLTMETER

1. GENERAL DESCRIPTION. This procurement requires an all solid state, true rms, digital voltmeter for use with the countermeasures test set.

2. CLASSIFICATION. The voltmeter described herein shall meet the requirements of MIL-T-28800, Type III, Class 5, Style E, Color R for Navy shipboard, submarine and shore applications with the following modifications and exceptions:

a. The relative humidity requirement is limited to 95% noncondensating.

b. Altitude. Not required

c. The equipment warmup period is 20 minutes.

3. OPERATIONAL REQUIREMENTS.

3.1 Measurement ranges.

3.1.1 DC voltage. 0 to ±300V.

3.1.1.1 Resolution. At least 1 mV for 20V full scale reading.

3.1.2 AC voltage. 50 μV to 300V (true rms).

3.1.2.1 Frequency response. 10 Hz to 10 MHz.

3.1.2.2 Resolution. At least 1 mV for 20V full scale reading.

3.2 Input connector. Binding posts (balanced) or BNC female (unbalanced).

3.2.1 Input impedance. At least 1 MΩ shunted by < 50 pF.

3.2.2 Common mode rejection. > 80 dB for ac; > 120 dB for dc.

3.3 Measurement rate. At least 2 or more readings/sec.

3.4 Accuracy.

3.4.1 DC. Within ±0.5% of range selected.

3.4.2 AC. Within ±2% of range selected.

3.4.2.1 Maximum crest factor. 4

3.5 Display. 4-1/2 digit display.

3.5.1 Units. Volts ac and dc.

4. GENERAL REQUIREMENTS.

4.1 Power. 100/120/220/240 Vac ±10% at 47 to 63 Hz; 40 VA maximum.

4.2 Dimensions. 25.4 cm x 35.56 cm x 10.16 cm (10 in x 14 in x 4 in).

4.2.1 Volume. 9,200 cm^3 (560 in^3).

4.3 Weight. 4.5 kg (10 lbs) maximum.

4.4 Calibration interval. The calibration interval shall be 12 months minimum. The equipment shall be within all accuracy requirements specified herein, with a 72% or greater confidence factor following a calibration interval of 12 months.

4.5 Remote operation. All front panel functions controllable via IEEE-488( ) interface bus.

4.5.1 Talker function. Unit capable of sending readings via IEEE-488 to system controller.